THE NAUTILUS

Vol. 54 October, 1940 No. 2

THE ROCK DWELLERS OF THE FLORIDA KEYS

BY B. R. BALES, M.D.

To see a shell collector sally forth armed with a hammer and chisels, might seem incongruous, but such equipment is necessary when hunting the various species of bivalve mollusks that spend their entire lives in their self-made sepulchres in the solid coral rock.

During the past two winters spent collecting specimens on the Florida Keys, I have taken ten different species of these "rock dwellers" and have learned a few facts regarding their life histories. To be successful in taking specimens, the collector must first learn by what means their burrows may be located or just what "sign" is evident upon the surface of the rock which will indicate that a mollusk is hidden within.

The sign of *Lithophaga antillarum* is a small oval opening, perhaps a half inch long and one fourth inch in the smaller diameter. The burrow extends backward horizontally; is smooth, straight, and conforms to the shape of the shell.

Lithophaga nigra has the same "sign," but it is smaller. The burrows of both are somewhat larger than the shell, which enables the mollusk to have a certain degree of motion within its cell, though motion is very much restricted. Both of these have very definite preferences regarding location. They are seldom seen where the adjacent ocean bottom consists of sand that is easily stirred up nor in rocks that may be covered by moss or algae. Frequently a long line of rocky shore may contain a colony of Lithophagas in but a small portion, as adjacent portions are apparently unfavorable; thus, they may be found in a space of but a few yards in extent, although the rocks may extend for a mile. Occasionally both may be found in large and movable slabs of

rock, though they prefer the solid rock that forms the coast line of the Keys.

Quite different is the "sign" of *Lithophaga bisulcata.* This is merely a small round hole, and the tip of the shell is often seen just below the opening, although the mollusk retreats out of sight at the slightest disturbance. Bisulcata burrows are usually vertical and although occasional burrows may be horizontal, the vertical position is the usual one. The burrows do not penetrate as deeply into the rock as the other two Lithophagas.

The burrows of most of the "rock dwellers" are usually near the tide line at low tide which facilitates the removal of the shells, but when the burrow entrance is under water, it is located by seeing the mantle of the mollusk at the burrow entrance. This is black in *Lithophaga nigra,* but is brown in *antillarum.*

Botula fusca has a brown mantle similar in color to that of *Lithophaga antillarum,* but this mollusk is more difficult to find; possibly by reason of its rarity or from the fact that it has no regular "sign". The burrow entrance may resemble the oval entrance of *Lithophaga antillarum* or it may be just another small hole in the rock. The shell, also, is more difficult to remove. With the Lithophagas, as soon as enough of the rock has been chipped away to expose the anterior portion of the shell, a firm grasp of the finger tips, with a gentle rotary motion to loosen the byssus, will bring the shell to light. Not so with *Botula fusca;* the rock must be chipped away until the entire shell is exposed, as the swelling at the umbones and the firmer attachment of the byssus makes it impossible to remove it intact otherwise. Several choice specimens were broken before this fact was learned.

Rupellaria typica is usually found just below the surface on the tops of wave washed rocks and by its accessibility is probably the easiest "rock dweller" to remove. Its "sign" consists of two small holes resembling the punctuation mark, colon. These two small holes are in reality the tips of the two siphons which disappear as soon as touched. At low tide, favorable rocks are fairly peppered with them.

Petricola lapicida also is found just below the surface of horizontal rocks and the "sign" is similar to *Rupellaria,* though they seem to be more frequently found in deeper water.

Gastrochaena ovata and *rostrata* present another problem in rock chipping. Unlike the before mentioned rock dwellers which are found but a short distance in the rock from the burrow entrance, these construct a more or less elaborate burrow. The "sign" cannot be mistaken for anything else. Built up at the entrance to the burrow are two pearly cylinders of shell secreted by the mollusk; there is a narrow slit at the point where the cylinders meet. The two siphons of the animal may be seen at the tips of the cylinders when it is undisturbed. The portion of the burrow immediately below the cylinders carries out the double character of the cylinders for a short distance; after that the burrow is cylindrical and smooth for about an inch; then the remainder of the burrow which comprises about four-fifths of its length is corrugated, with distinct and prominent ridges running crosswise. This extends downward to the enlarged smooth bottom chamber where the shell rests. The length of the burrow varies and is dependent upon the age and size of the mollusk and the character and hardness of the rock. The entire burrow is lined with a nacreous or shelly substance which seems to be more heavily applied to the sides of the burrow at the corrugated portion. It has been found that the two pearly cylinders at the opening of the burrow are normally about one-fourth inch in height when free from any corralline or other extraneous marine growth, but when such growths are deposited upon the cylinders, the mollusk adds more to the tops of the cylinders and continues to add to their height as the foreign growth increases. Specimens with coral incrusted cylinders have been found that were fully one inch above the rocky entrance to the burrow.

Unlike the Lithophagas, the Gastrochaenas do not have a straight burrow, but it is more or less tortuous, evidently following the line of least resistance and the collector is never sure just where to expect to find the shell and many are broken. Very frequently, the burrow opening when found is above the water level, but it may range downward until the end is well below the water which makes chipping difficult and hazardous to the integrity of the shell. If care is taken, the mollusk may be taken alive and placed in a vessel of sea water for observation; and it presents, indeed, a curious spectacle. I have seen them placed in a test tube of water and set aside for a period; after the mollusk

has recovered from the shock of removal from its home, it sends out the soft, movable portion of its body. This is light colored and is surmounted by the two dark siphons. In some instances it has extended the full length of the test tube, the body being four or five inches long and with a diameter of at least one half inch—all this from a small shell less than an inch long. It might be interesting to know the reason for the corrugated portion of the burrow and why it is smooth at both ends.

In the study of this interesting group of mollusks, the student is confronted with the problem of just how they form their burrows. No doubt all of them enter some small hole in the rock when they are very small and as growth proceeds, they enlarge it to conform to their ever enlarging bodies, but how this is accomplished, remains to be learned. Several theories have been advanced. Some say that the mollusk secretes some substance that attacks or has a tendency to soften the lime of the rock, enabling the animal to fashion its burrow, but it would seem that any acid that would attack the lime of the rock, would also attack the lime of the shell. Others have contended that the burrow is formed by friction, and that the rock is worn away by the turning of the shell in the burrow. None of the shells show any evidence of such a procedure and many are so fragile that even a small amount of friction, if it did not break the shell outright, would present some evidence of wear on the shell itself. Another theory is that the rock is worn away by the soft parts of the mollusk, working endlessly on the unyielding rock. Taking into consideration that the mouth or opening of the shell points to the opening of the burrow, this would not permit the operation of a radula or other organ of the animal even if it had one, in fashioning its burrow, for the burrow is formed *back* of the shell. The mollusk does not burrow forward into the rock, but backs into it. It is very evident that this class of mollusks offers the opportunity for intensive study relative to the life histories of the various species.

To take them is one of the hardest forms of collecting, and it is attended with many a disappointment, for frequently just as a specimen is about to be secured, an injudicious blow of the hammer fractures the shell. To collect them the student must needs have more than the usual amount of enthusiasm and a strong back.